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ABSTRACT

Keeping vocabulary and content constant, it was determined whether syntactically more complex structures increase reading difficulty or whether all students, regardless of grade level, have the same syntactic skills and thus read with equal facility materials written at different syntactic maturity levels. One hundred and twenty randomly selected students from grades 4 through 12 in a Florida school system were the subjects. They were given prototypic passages about the making of aluminum as rewritten by typical fourth, eighth, and twelfth graders and skilled adults, exhibiting syntactic characteristics of the average performance at each age level. Every fifth word was deleted, and no paragraphs contained the first or last words deleted. The test was given without verbal instructions or assistance, and no time limit was set. Data were subjected to one-way analysis of variance. The results showed that grades 4, 10, and 11 differed significantly between the four levels of writing. Fourth, fifth, and sixth graders read fourth-grade writing best; eleventh graders read it with least facility. Students in grades 8 through 12 found eighth-grade writing easier to read than either the fcurth-grade writing or the more difficult passages. References, tables, and the prototype passages are included. (Author/CL)

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THE EFFECT OF TRANSFORMED SYNTACTIC STRUCTURES ON READING

The effect of syntax on reading comprehension has commanded the attention of several researchers during the past decade; however, their studies were conducted using subjects from only one or two grade levels. Recent research on the developmental syntax of students' written compositions has provided the basis for a technique which allows the investigation of reading skills at several grade levels (2, 6). These studies have shown that older students incorporate more material into each T-unit*, thus making the T-unit transformationally more complex. The measurement techniques developed in these studies allow an experimenter to rewrite one passage, of any length, at several

*A T-unit is a main clause plus any subordinate clause or non-clausal structure attached to or embedded within it.

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different levels of syntactic complexity, each level reflecting student performance at a particular grade level (or level of maturity). Consequently, a set of passages could be devised in which only the syntax would vary while retaining the same vocabulary and content.

PURPOSE

The purpose of this research was to determine whether syntactically more complex structures increase reading difficulty, or whether all students, regardless of grade level, have the same syntactic skills and thus read with equal facility material written at different levels of syntactic maturity, providing the vocabulary and content are held constant.

CONSTRUCTION OF THE INSTRUMENT

The test instruments were derived from a transformational analysis of the data from Hunt's study (2). Hunt asked students from grades 4, 6, 8, 10 and 12 and skilled adults to rewrite a passage about the making of aluminum. The passage was presented in the form of kernel sentences. From the analyses of the data from the 4th, 8th, 12th and skilled adult rewrites, the prototypes of each level were written (Appendix 1); that is, after determining what Hunt's subjects typically did with each input kernel, the prototypes were written accordingly, keeping all syntactic characteristic measurements as close to Hunt's means as possible (Table 1). For example, Hunt's data indicated that 8th graders normally used the first input kernel as the main clause of the first sentence. Consequently, the same kernel was so used in writing the prototype of the 8th grade writing. These 8th graders normally converted about 4 input kernels to subordinate clauses. In the prototype the number of subordinate clauses

was increased to 5, for if only 4 had been used, it would have necessitated unacceptable changes in other syntactic characteristics.

Thus, the instruments were simply the "Aluminum" passage as rewritten by "typical" 4th, 8th, 12th graders and skilled adults. These paragraphs were typical in the sense that they exhibited the syntactic characteristics of the average performance of an average group at each level. The syntactic characteristics were determined by the analysis of the rewritten forms collected. All characteristics were quantifiable; no subjective interpretations were used.

Many readability formulae use sentence length as a determining factor; therefore, it was deemed necessary that sentence length be held constant in all paragraphs. Since the only difference between sentence length and T-unit length is the number of coordinated T-units (i.e., the number of words per T-unit multiplied by the number of T-units per sentence equals the number of words per sentence; W/T-u• T-u/S=W/S,), the skilled adult T-unit length was used as the standard sentence length. This kept the standardized sentence length at the lowest feasible size. The sentence length of the other paragraphs was increased to the standard length by coordinating T-units.
In the 4th grade passage, the number of coordinated T-units was doubled. This method of equalization was chosen because pilot studies using different amounts of T-unit coordination showed that it does not affect reading difficulty.

Once the paragraphs were written, they were each rewritten using every sequence of the "every-fifth" word deletion schedule. That is, each paragraph was written deleting every fifth word beginning with the second word, then beginning with the third word, then the fourth and fifth, and finally with the sixth word. In no instrument was either the first or last word of the paragraph deleted.

PROCEDURE

120 students were randomly selected from each of the grades 4 through 12 in a Florida school system. Each subject was given one of the test instruments.

The teachers in the system administered the tests. Since the directions were written on each instrument, no verbal instructions were given before, nor assistance during, the test. No time limit was imposed, for prior testing showed that no subject required more than 40 minutes to complete the test.

HYPOTHESES

It was hypothesized that there would be no significant difference (1) in comprehensibility between the four levels of writing at each grade level of reader, and (2) in comprehension between the nine levels of readers on each level of writing.

RESULTS

The data were subjected to separate one-way analyses of variance tests. The results showed that the fourth, tenth and eleventh

grade Ss significantly (.05) distinguished between the four levels of of writing. The fourth graders read the fourth grade writing best; and the eleventh graders read the fourth grade writing with least facility. However, the older Ss (grades 10, 11, 12) consistently read all levels of writing significantly (.01) better than did the younger Ss (grades 4, 5, 6).

DISCUSSION

The results of this research are interesting in relation to previous studies. Ruddell (7) showed that fourth graders read more easily passages constructed using the sentence patterns produced with high frequency by fourth graders. Two possible interpretations of Ruddell's results can be proposed: (1) Since the high frequency patterns were simpler (i.e., less complex), the redundancy was higher, thus enhancing the predictability of the words; (2) the results could also mean that fourth graders read best what they themselves normally produced, but lose efficiency when reading more mature structures. The results of the present research tend to support the second interpretation, for only in the early grades was the highly redundant writing read better. Had all students at all grade levels read the fourth grade level of writing best, the first interpretation would have been preferred. This was not the case. It should be noted, however, that in the case of just the fourth graders, not considering any other grade level, either interpretation could be accepted.

A comparison of the studies by O'Donnell (5) and DeLancey (1) suggested that while older students would perform better than younger

students on any material written at any level of syntactic maturity, the students' performances would be inversely related to the level of complexity. O'Donnell's test was written at the 8th grade level of writing and Delancey's between the fourth and eighth grade levels. The comparison with the the results of instruments written at similar levels in the present reserach shows that the suggested inverse relationship does not exist.

The results of her research led Nurss (4) to state that "less complex structures were easier to understand in oral and silent reading modes, but more difficult to understand in the listening mode (4, p. 87)." It has long been believed, although not adequately tested (3), that a child's receptive skills are superior to his productive skills, and that of the receptive skills, listening is more advanced than reading. Consequently, it is not illogical to assume that a child's listening skills would be equivalent to an older child's reading skills. If this assumption is accepted, Nurss's findings predict the results of the present research. The children in her study read the least complex writing best, just as the youngest children in the present research did. The more mature students in the present research read the more complex writing with higher comprehension. Similarly, Nurss's children understood better, in the listening mode, the more complex structures.

A critical analysis of the data (Figure 1) revealed that the elementary grade subjects read the fourth grade level of writing best, but that the eighth grade level of writing soon became easier to read. Even the 12th grade and skilled adult writing was easier to read than the 4th for all high

school students.

The data further indicated that while there was little change over the several grades in the comprehension of the fourth grade level of writing, there was a notable increase in the other three levels, particularly in the 8th grade level of writing.

In theory, the cloze technique is based on predictability. The person taking the test must, from the context, predict the missing words. It logically follows that the most redundant writing would provide the most clues and therefore increase the predictability. If this were true, the 4th grade writing would be the easiest to predict from, for it is distinguished by the absence of complexity. Where a more mature writer would reduce two or more kernels to one by the process of embedding, the 4th grader is more apt to coordinate the entire kernels if, indeed, he doesn't retain them both as full sentences. Therefore, the theory would predict that all students would be able to make more correct predictions on the 4th grade level of writing and the fewest on the Skilled Adult level of writing. This however, does not seem to be the case. The lack of improvement in facility in reading the fourth grade level of writing indicates that redundancy is not the only factor in prediction (providing, of course, that the student knows the words). There must be some other factor or factors involved in the process of reading which would cause the more mature readers to make incorrect predictions on very simple writing, yet be more correct on more mature writing.

One possible factor could be, for lack of a better word, habit.

The older subjects do not normally encounter simple, non-complex sentences. The younger subjects do not normally read complex sentences. Furthermore, research has demonstrated that older students write more complex sentences. Consequently, the redundancy level the reader is accustomed to in both reading and writing may affect, possibly determine, the predictions he would make on a cloze test. When confronted with a passage of different complexity, predictability would be lessened.

From this possible conclusion, a tentative hypothesis can be formulated to explain the differences in comprehension on the various levels of writing used in this research: As a student matures he comprehends best the material which is written near his own productive syntactic level, providing the vocabulary and content are not foreign to him. In essence, this hypothesis says that what the student normally produces (i.e., the syntactic level at which he writes) influences or is influenced by the syntactic level at which he reads. To test the hypothesis, it would be necessary to devise test instruments similar to those used in the present research, and have them read by college students and skilled adults as well as students from grades 4 through 12.

If the hypothesis is adequate, the results of such an experiment should show that: (1) the subjects' comprehension of the 4th grade level of writing increases less than the other levels, and only the elementary grade subjects read it best; (2) the subjects' comprehension of the 8th grade level of writing increases rapidly until about the

early college level. The subjects in and above the 8th grade should read the 8th grade writing better than they read 4th grade writing; (3) The comprehension of the 12th grade level of writing increases less rapidly than the 8th grade level in the early years, but becomes easier to read than 8th grade writing during the college years; (4) The comprehension of the Skilled Adult level of writing would initially increase less rapidly than the 12th grade writing by subjects in the late college years. The skilled adults should clearly read Skilled Adult writing best.

CONCLUSION

This study was designed to investigate the effects of increasing syntactic maturity on the reading comprehension of students at nine grade levels, when vocabulary, sentence length, and content were held constant. The findings of the study would seem to indicate the following conclusions.

For students in grades 4, 5, and 6, 4th grade writing appears to be easier to read than writing by more mature students. But for older students, 4th grade writing is not the easiest.

The more mature students (i.e., in grades 8 through 12), find 8th grade writing easier to read than either the simpler 4th grade writing or the more complex writing of 12th graders or skilled adults.

Since 4th grade writing is the most redundant, word predictability

(which is what the cloze technique measures) is more than a function of redundancy for the students in the middle and upper grades. However, for the lower grade students (i.e., 4th, 5th, and 6th) it might be just redundancy. This phenomenon is open to speculation.

The findings of this study offer no definite conclusions about the appropriateness of different syntactic levels of writing in the reading material at various grade levels, but there are indications that the productive level may determine the best receptive level.

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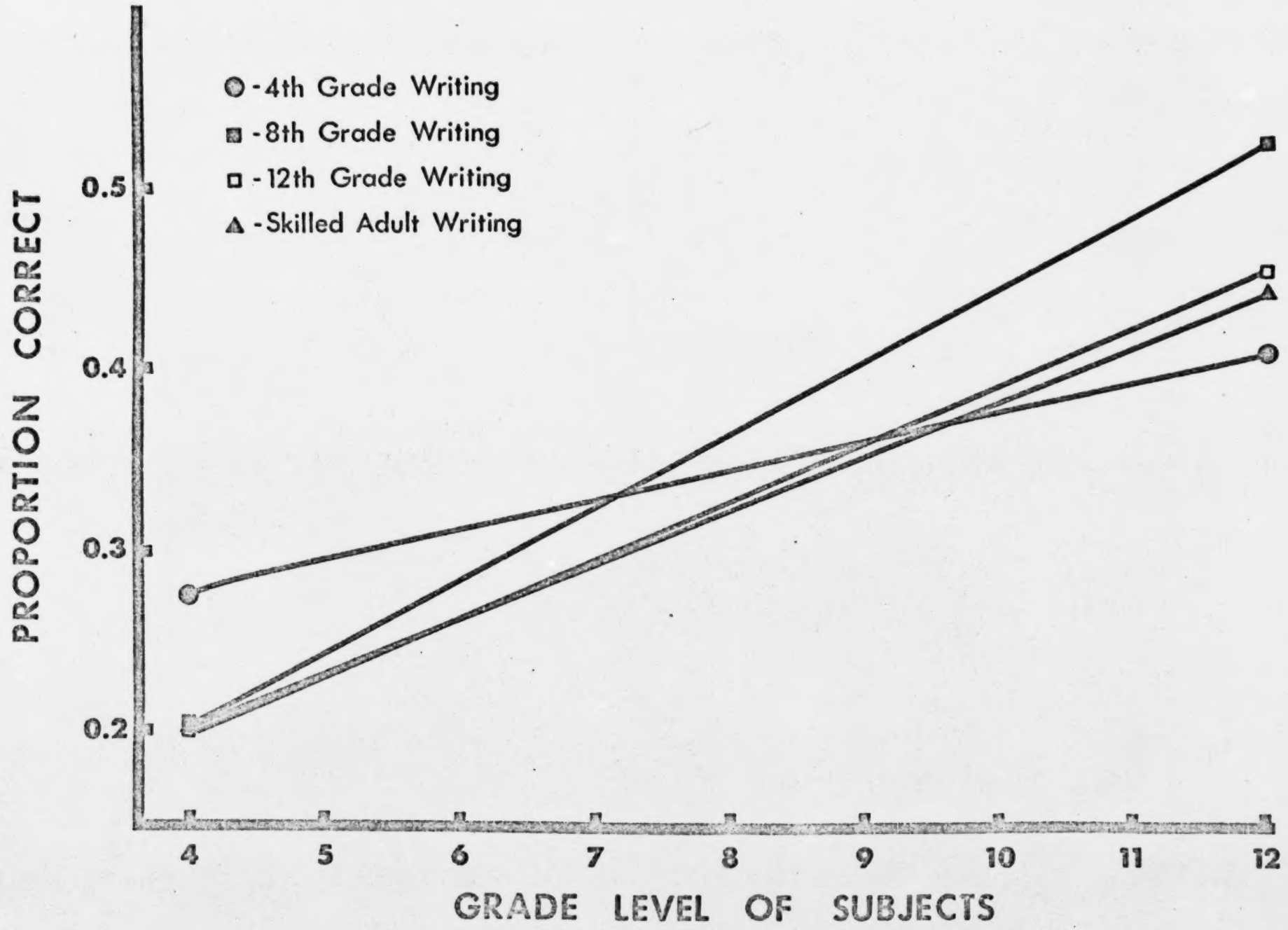
TABLE 1

THE "ALUMINUM" PASSAGE: STATISTICS COMPARING ACTUAL WRITING WITH PROTOTYPES

Syntactic Characteristic	Fourth Grade Passage			Eighth Grade Passage			Twelfth Grade Passage			Skilled Adult Passage		
	Hunt's Data		Proto-	Hunt's Data		Proto-	Hunt's Data		Proto-	Hunt's Data		Proto-
	Mean	S.D.	type	Mean	S.D.	type	Mean	S.D.	type	Mean	S.D.	type
Words/Clause	5.19	.88	5.45	6.79	1.12	6.77	7.85	1.20	7.79	9.95	1.58	10.33
Clauses/T-Unit	1.04	.11	1.04	1.43	.29	1.38	1.44	.27	1.56	1.51	.30	1.50
Words/T-Unit	5.42	1.13	5.64	9.48	3.06	9.38	11.30	2.64	12.11	14.78	3.26	15.50
Words/Sentence			15.80			15.25			15.57			15.50
Coordinated Main Clause	8.84	5.64	18.00	2.44	2.89	3.00	.64	.37	2.00	.24	.99	0.00
Coordinated Predicates	1.86	5.20	2.00	2.28	1.67	2.00	1.82	1.43	2.00	1.48	1.46	1.00
Less Than Predicate	1.66	2.88	1.00	9.72	4.48	12.00	13.52	6.17	16.00	17.64	2.64	22.00
Less Than Clause	3.52	2.40	3.00	11.96	4.05	14.00	15.48	3.53	18.00	19.12	2.21	23.00
Subordinate Clauses	.58	1.41	1.00	4.16	2.17	5.00	3.62	1.74	5.00	2.16	1.40	3.00

Figure 1

Regression Lines for Each Level of Writing



APPENDIX A

Prototype Passages

Prototype Passages

ALUMINUM
4th Grade Level of Writing

Aluminum is a metal, and it is abundant, and it has many uses, and it comes from bauxite. Bauxite is an ore, and bauxite looks like clay, and bauxite contains aluminum, and it contains several other substances, and workmen extract these other substances from the bauxite. They grind the bauxite and put it in tanks, and pressure is in the tanks, and the other substances form a mass. They use filters, and they remove the mass, and a liquid remains. They put it through several other processes, and finally it yields a chemical, and the chemical is powdery and is white. The chemical is alumina which is a mixture, and it contains aluminum, and it contains oxygen. Workmen separate the aluminum from the oxygen by using electricity. They finally produce a metal, and the metal is light, and it has a luster, and the luster is bright, and the luster is silvery. This metal comes in many forms.

ALUMINUM
8th Grade Level of Writing

Aluminum is an abundant metal, has many uses, and comes from bauxite which is an ore that looks like clay. Bauxite contains aluminum and several other substances. Workmen extract aluminum from bauxite by grinding it, then putting it in pressure tanks where the other substances form a mass. The mass is removed by filters, and a liquid remains. The liquid is put through several other processes, and finally it yields a powdery, white chemical. The chemical is alumina, a mixture which contains oxygen and aluminum. Workmen separate the aluminum from the oxygen by the use of electricity, and finally a metal is produced. This metal is light, and it has a luster which is bright and silvery, and it comes in many forms.

Prototype Passages

ALUMINUM
12th Grade Level of Writing

Aluminum is an abundant metal with many uses, and it comes from an ore called bauxite which looks like clay. Bauxite contains aluminum and several other substances which are extracted from it. Workmen grind the bauxite and put it in pressure tanks. The other substances form a mass which is removed by the use of filters. A liquid remains and is put through several other processes which finally yield a white, powdery chemical called alumina. Alumina is a mixture containing aluminum and oxygen, which are separated by the use of electricity. Finally a light metal with a gright, silvery luster is produced, and this metal comes in many forms.

ALUMINUM
Skilled Adult Level of Writing

Aluminum, an abundant metal with many uses, comes from bauxite, an ore which looks like clay. To extract the other substances from the aluminum found in bauxite, the bauxite is ground and is put in pressure tanks. The other substances form a mass which is removed by filters. The remaining liquid is put through several other processes, finally yielding a powdery, white chemical, alumina, which is a mixture of aluminum and oxygen. The oxygen is removed by electricity, producing a light metal with a bright, silvery luster. This metal comes in many forms.